

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) This question paper contains **33 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 16 carry 1 mark each.
- (iii) Section B: Questions 17 to 21 carry 2 marks each.
- (iv) Section C: Questions 22 to 28 carry 3 marks each.
- (v) Section D: Questions 29 to 30 carry 4 marks each.
- (vi) Section E: Questions 31 to 33 carry 5 marks each.
- (vii) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (viii) Draw neat, properly labelled diagrams wherever necessary.

Section A

1. Perisperm present in seed of black pepper is remnant of

- | | |
|------------|---------------|
| (A) Ovary | (B) Nucellus |
| (C) Anther | (D) Megaspore |

2. Interferons are most effective in making non-infected cells resistant against the spread of which of the following diseases?

- | | |
|---------------|----------------|
| (A) Malaria | (B) Ascariasis |
| (C) Pneumonia | (D) Cancer |

3. Which of the following sacred groves is found in Meghalaya?

- | | |
|-------------------|-------------|
| (A) Jaintia hills | (B) Bastar |
| (C) Chanda | (D) Sarguja |

4. In an ecosystem, different species occupy different levels and vertical distribution of species is found. This is called _____.

- | | |
|--------------------|----------------|
| (A) Stratification | (B) Layering |
| (C) Fragmentation | (D) Population |

5. Which of the following statements about plasmids is incorrect?

- | | |
|---|---|
| (A) Plasmids have the ability to replicate within the bacterial cell. | (B) Their replication is controlled by chromosomal DNA. |
| (C) They are autonomously replicating circular extra-chromosomal DNA. | (D) They often carry antibiotic resistant genes. |

6. Which connective tissue connects ovary to pelvic wall and uterus?

- | | |
|---------------|---------------|
| (A) Tendons | (B) Ligaments |
| (C) Cartilage | (D) Bone |

7. Select the option that shows correct statements:

- (i) Corpus luteum secretes progesterone.
(ii) Only FSH attains a peak level in middle of cycle.
(iii) LH surge induces rupture of graafian follicle.
(iv) Luteal phase of menstrual cycle is also called proliferative phase.
- | | |
|---------------------------|--------------------------------|
| (A) Only (ii) is correct. | (B) (i) and (iii) are correct. |
| (C) Only (iv) is correct. | (D) (ii) and (iv) are correct. |

8. Which one of the following evidences does not support Darwin's theory of natural selection?

- | | |
|---|------------------------------------|
| (A) Branching Descent | (B) Small & directional variations |
| (C) Appearance of new traits by mutations | (D) Survival of the fittest |

9. Expression of a particular gene helps to identify transformants. What is this gene known as?

- | | |
|-----------------------|---------------------|
| (A) Plasmid | (B) Structural gene |
| (C) Selectable marker | (D) Intron |

10. A DNA molecule is 140 base pairs long. It has 20% thymine. How many guanine bases are present in the molecule?

- (A) 64 (B) 84
(C) 32 (D) 56

11. Select the mismatched pair:

- (A) Mega diversity countries in the world - 12 (B) Genetically different strains of rice in India - Less than 1000
(C) Robert May's estimation on global species diversity - 7 million species worldwide (D) Zoological parks - Ex-situ conservation

12. Pomato was produced by fusing protoplasts of

- (A) Tomato and Potato (B) Pomegranate and Tomato
(C) Pomegranate and Potato (D) Pomegranate, Potato and Tomato

13. Assertion (A): Fossils provide direct evidence for evolution.

Reason (R): Fossils help to trace evolutionary relationships among organisms over time.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation for Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

14. Assertion (A): In terrestrial ecosystem much larger fraction of energy flows through grazing food chain.

Reason (R): Grazing food chain may be connected to Detritus food chain at some levels.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation for Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

15. Assertion (A): The milk produced by transgenic cow 'Rosie' was nutritionally more balanced product for human babies than natural cow milk.

Reason (R): It was human protein enriched milk containing human alpha lactaglobulin.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation for Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

16. Assertion (A): Flocs are masses of bacteria associated with fungal filaments in secondary treatment of sewage.

Reason (R): Flocs help in digestion of solid waste by anaerobic respiration.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation for Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

Section B

17. A health officer visiting two different regions reported the following symptoms in patients:

Region A - Sustained high fever with stomach pain, constipation and loss of appetite.

Region B - Inflammation in the lower limbs and genital organs.

Name the diseases likely affecting the patients in regions A and B. Write the scientific name of the causative organisms in both the cases.

18(a)(i). How does a farmer use dormancy of seed to his advantage?

18(a)(ii). Differentiate between pea seed and castor seed.

OR

18(b). Identify the stage of follicle where primary oocyte undergoes first meiotic division. Also mention the products of this division.

19. Write any two advantages of producing plants by micro-propagation.

20(a). Mendel published his work on inheritance in 1865, but it remained unnoticed for over three decades. State the reasons why his work was not recognised during his life time. (4 points)

OR

20(b). What is adaptive radiation? Give one example from any habitat.

21(a)(i). What is primary productivity of an ecosystem and how is it expressed?

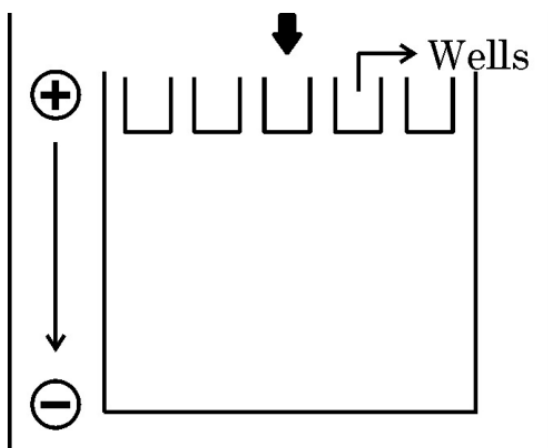
21(a)(ii). Explain the equation given below:
$$\text{NPP} = \text{GPP} - \text{R}$$

OR

21(b). Biodiversity conservation is crucial for maintaining ecological balance and ensuring the survival of future generations. Describe four advanced ex-situ methods used for conservation of biodiversity.

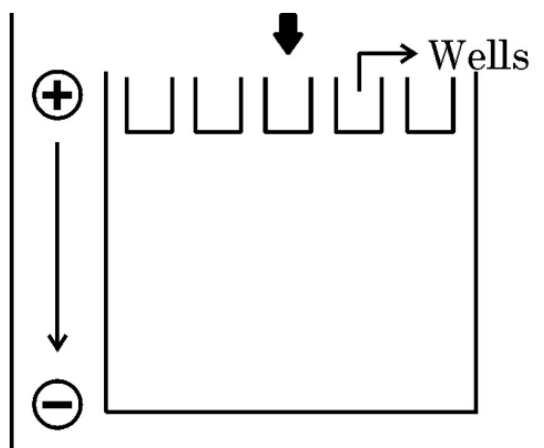
Section C

22(a). Observe the given picture carefully. A mixture of DNA with fragments ranging from 100 base pairs to 1800 base pairs were separated by electrophoresis on agarose gel with the following arrangement:

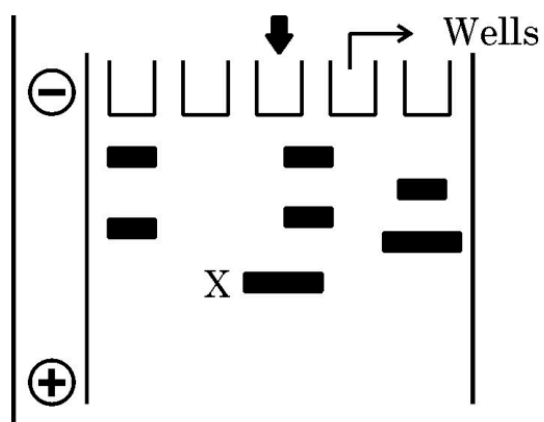


What result will be obtained in staining with ethidium bromide? Explain with reasons.

22(b). Observe the given picture carefully. A mixture of DNA with fragments ranging from 100 base pairs to 1800 base pairs were separated by electrophoresis on agarose gel with the following arrangement:



The above setup was modified as shown below and a band with 100 base pairs was obtained at X.



What changes were made to the previous design to get a band at 'X'. Why did the band appear at 'X'?

23(a). Mention the scientific name of the source plant and the part from which opioids are extracted.

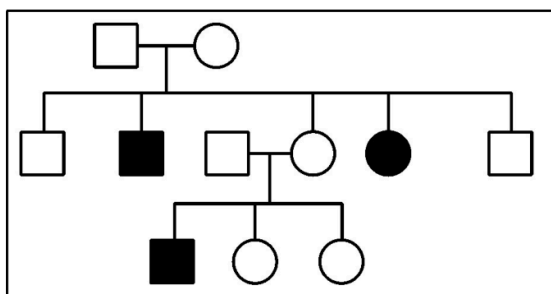
23(b). How are morphine and heroin related? Mention the effect each one of them has on human body.

24(a). Do all pollen grains remain viable for the same length of time? Support your answer with two suitable examples.

24(b). How are pollen grains stored in pollen banks?

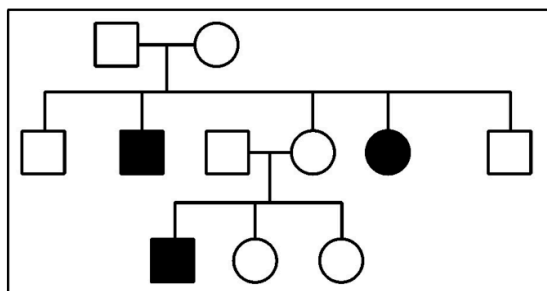
25(a). What is pedigree analysis? Mention its importance in human genetics. (2 pts.)

25(b)(i). Analyse the following pedigree and write the



Pattern of inheritance.

25(b)(ii). Analyse the following pedigree and write the



Give one example of disease showing such an inheritance pattern.

26(a). How is Hardy-Weinberg expression ($p^2 + 2pq + q^2 = 1$) derived?

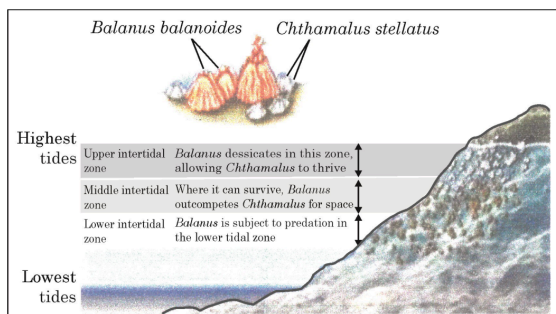
26(b). List any two factors that disturb the genetic equilibrium.

27. Suggest and describe a technique through which a healthy sugarcane plant can be obtained from virus infected sugarcane plant.

28. Draw a neat diagram of megasporangium of an angiosperm and label any six parts.

Section D

29(a). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.

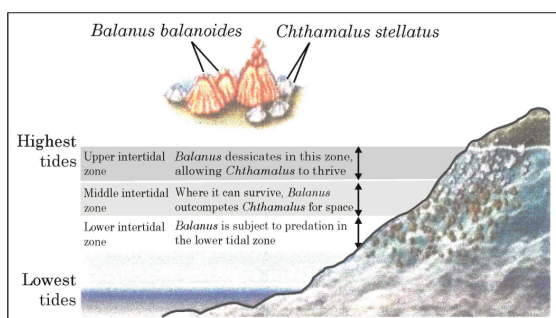


When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

Identify and define the ecological phenomenon demonstrated by this observation.

OR

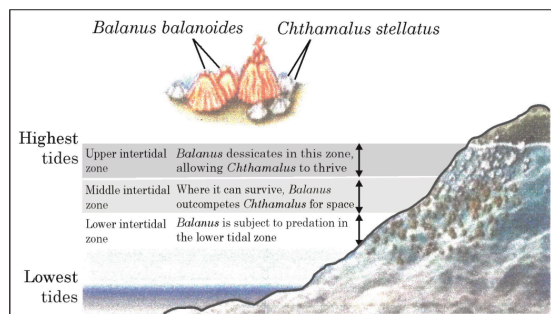
29(a). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.



When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

State the principle that explains the elimination of one species.

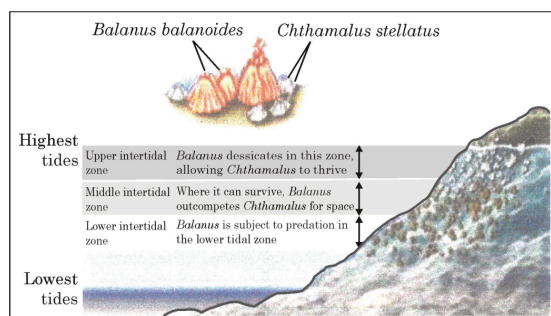
29(b). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.



When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

Two different species can compete for the same resource. Give another example of it.

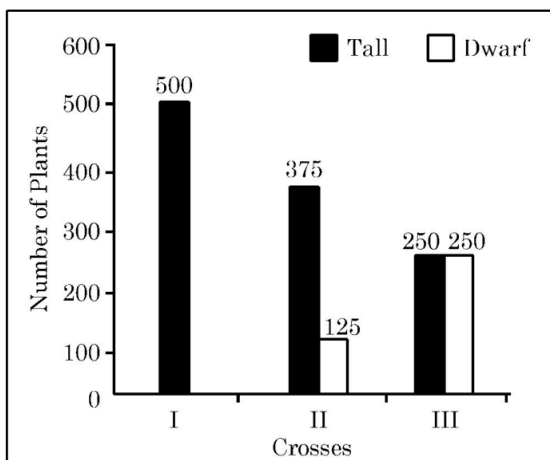
29(c). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.



When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

How do species avoid competition in nature? Explain with an example.

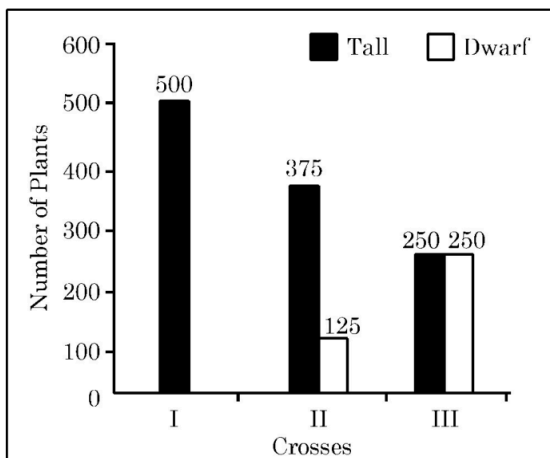
30(a). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



What can you infer about the genotype of parents in crosses I and II?

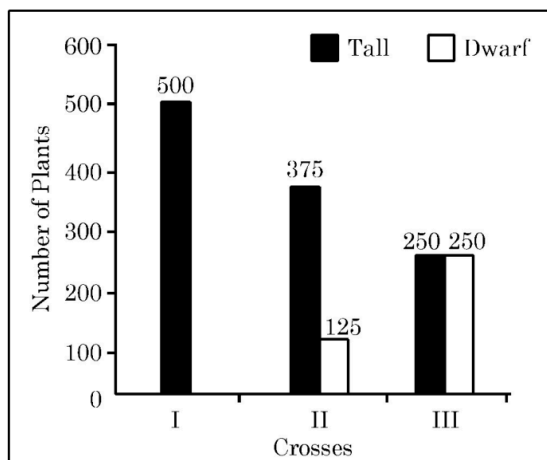
OR

30(a). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



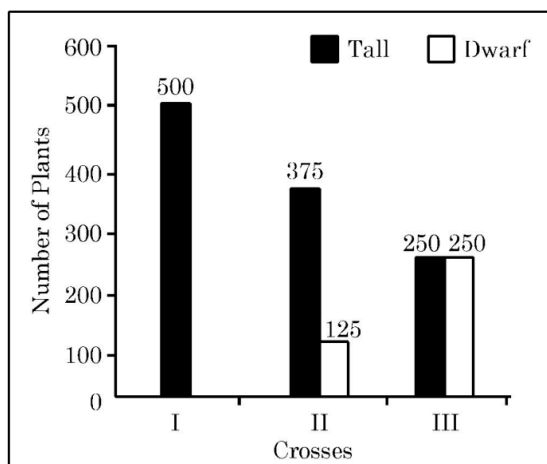
Which genetic cross is represented by these crosses?

30(b). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



Looking at bar graph of cross III, identify the type of cross performed and its importance in genetics.

30(c). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



What conclusion can you draw from the results of bar graphs of crosses I and II? Name the genetic principle illustrated.

Section E

31(a)(i). Name the protozoan species that is responsible for causing the most serious and even fatal malarial disease.

31(a)(ii). Name the host in which the parasite completes its sexual stages and explain the changes taking place.

31(a)(iii). How does the parasite damage the human body after entering the blood stream?

31(a)(iv). Suggest two effective preventive measures to control the spread of this disease in endemic regions.

OR

31(b)(i). What are bio-fertilizers?

OR

31(b)(ii). Name the different types of microorganisms used as bio-fertilizers in organic farming and explain how each contributes to soil fertility.

OR

31(b)(iii). Write two advantages of using bio-fertilizers over chemical fertilizers.

32(a). Describe how the lac operon operates both in the presence and absence of an inducer in *E.coli*.

OR

32(b)(i). Differentiate between Mendelian and Chromosomal disorders.

OR

32(b)(ii). Which disorder is known as 'Inborn Error of Metabolism'? Mention its cause and any one symptom. Name the harmful compounds formed.

33(a). Trace the events from fertilization till implantation of blastocyst in human female. Also mention the site where fertilization takes place.

OR

33(b)(i). Case studies of some couples are given below. They were not able to have kids even though the parents were not taking any precautions. They also do not wish to adopt a child or take the help of donors. Study these cases and suggest an appropriate Assisted Reproductive Technology that could help them.

Case I - Female - Normal Reports. Male - Normal sperms but no connection between epididymis and vas deferens.

Case II - Female - Normal eggs but Fallopian tube blocked. Male - Normal sperms. Male reports are normal.

Case III - Female - Normal Reports. Male - Low sperm count with less motility.

OR

33(b)(ii). Copper releasing intrauterine devices are very effective and popular contraceptive devices. Name any two copper releasing IUDs. Write two reasons that make them effective contraceptives.

- End of Question Paper -